Pharmacology *via* E-Mail: Communicating with the Beast

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Computer use in medical education often focuses on simulation of a physiological model [1], interactive-multimedia tutorials, so called computer-based instruction [2], or medical informatics [3]. We have incorporated elements representing each of these into the delivery of our pharmacology course and enhanced their utility by employinge-mail as a tool to communicate with individual students or the entire class.

PHARMACOLOGICAL SIMULATIONS

MacKinetics (L. Moore, USUHS) is a laboratory simulation exercise, available on Macintosh and MS-DOS platforms. It replaced an animal laboratory 12 years ago and is designed to assist students with the concepts of drug absorption, distribution, and elimination. Students use *MacKinetics* to reinforce didactic exposure to pharmacokinetics in lecture. Working in pairs, students are required to complete a representative set of problems and turn in a printed record of the simulation as well as written responses to questions in the problem set. *MacKinetics* allows students to simulate realistic clinical drug administration schedules, which are frequently too complex to allow simplistic answers.

This year, a module from *The Laboratory in Pharmacology* (R. Stull, UAMSC, MS-DOS) replaced two of our animal laboratories. Students, working in groups of four, complete the *Effects of Drugs on the Autonomic Nervous System* module in the LRC. This module allows one to observe the effects of autonomic agonists and antagonists on arterial pressure and heart rate in a simulated, anesthetized laboratory dog. To complete the exercise, six groups of students meet with two laboratory instructors to determine the site of action of an *unknown* autonomic agent

COMPUTER-BASED QUESTION BANK

HyperPharm [4] is a data base of about 1700 pharmacology questions in machine gradable format on the Macintosh and MS-DOS platforms. Illustrations are incorporated where appropriate. The program provides faculty-prepared reinforcement or corrective guidance, depending upon the student response. Students may leave a comment or question for faculty review, providing a degree of interaction.

DRUG INFORMATION RESOURCES

This year we instituted a problem-based teaching exercise in our medical pharmacology course that requires students to solve an information retrieval problem using computer-based information resources. This exercise is described in a proposed interactive poster abstract in these proceedings. Students, working in pairs, address a realistic problem set and respond with written answers which are graded. Among the on-line resources explored are *Medline*, *Micromedex*, *PDR*, *AMA Drug Evaluations*, *American Hospital Formulary Service*, *USP Drug Information*, and *The Medical Letter*.

E-MAIL COMMUNICATION

Adding e-mail communication to our teaching effort has been very rewarding. USU medical students are required to use e-mail as part of their military duties and regularly access a minicomputer-based system. Each student has an e-mail account and distribution lists are available to address messages to an entire class. Students address question directly to faculty via e-mail. In addition, comments and questions about the information in *HyperPharm* are collected on a daily basis from a LRC file-server and e-mailed to a central mail account in the pharmacology department. The comments and questions are scanned for subject and e-mailed to the appropriate faculty for a response to the individual student. During the 1992 pharmacology course in excess of 400 messages passed between students and faculty.

After each examination, questions that were incorrectly answered by greater than 40% of the class are referred to the appropriate faculty member for explanation. These explanations are assembled into an exam *post mortem* and e-mailed to the entire class. Turnaround time is as short as 24 hours, and student reaction to this reinforcement has been very positive.

REFERENCES

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